# A Late Quaternary Herpetofauna from Saltville, Virginia

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*ABSTRACT.*— The late Quaternary herpetofauna from Saltville, Virginia, consists of at least two salamanders, two anurans, two turtles, and four snakes; all are forms that can be found living in the area today. The fossil herpetofauna originated from three $^{14}C$ dated stratigraphic units. Based on the presence of all 10 taxa of the herpetofauna in Units W2 (lower) and W3, it is reasonable to conclude that this fauna has been in place for the last 13,500 to 15,000 years. Because the most northern area where all members of the Saltville herpetofauna may be found living together today is in extreme northeastern Pennsylvania, the herpetofauna is clearly not a "Boreal" one. Moreover, Boreal temperatures, as we know them today, would not provide enough warm days for the eggs of *Chelydra serpentina, Chrysemys picta*, or *Elaphe* cf. *E. obsoleta* to hatch.

The late Quaternary fluvial and lentic sediments of the Saltville Valley in Virginia have yielded the remains of large mammals for more than two centuries (Jefferson 1787, Peterson 1917, Boyd 1952, Ray et al. 1967, McDonald and Bartlett 1983). Most of these remains were found during construction activities related to agriculture or the production of salt. The first purely scientific excavation in search of late Quaternary vertebrates at this locality was conducted jointly by Virginia Polytechnic Institute (VPI) and the Smithsonian Institution (SI) in 1966 and 1967. In 1978 and 1981 Charles Bartlett, Jr., performed salvage excavations at several locations in the valley for the Town of Saltville, and in October 1980 Bartlett and J. McDonald began controlled excavations in the valley. In 1982 McDonald initiated the Saltville Project, a multidisciplinary investigation of the late Quaternary history of Saltville Valley that included the collaboration of several specialists from different institutions in eastern North America. Late Quaternary deposits in the Saltville Valley have been shown to span some 27,000 years, including a continuous record for approximately the last 15,000 years (McDonald 1984, 1985a), making this locality unusually useful for the documentation of environmental change in the middle Appalachian region through the late Wisconsin and Holocene.

The first known herptile specimen to be collected at Saltville was a partial limb bone of an anuran (fam., gen. et sp. indet.) collected on 11 August 1966, by the VPI-SI field crew (Catalog and field notes, 1966, VPI-Smithsonian Saltville Expedition). Bartlett found the second specimen—a costal bone of the Painted Turtle, *Chrysemys picta* (USNM 404721)—on 30 October 1978 (C. S. Bartlett, Jr., field notes, 30 October 1978). The 1980-1984 Radford University excavations recovered numerous herptile specimens by wet screening the finer fluvial sediments and closely examining thinly sliced lentic deposits of clay and silt. Vertical and horizontal provenience and matrix data for specimens have also been collected since 1980, which allows differentiation of faunules and inferences about faunal change (or the absence of change) over time.

Here, we describe the generically and specifically identifiable herptile material collected at Saltville through 1984, including the division of this material into three radiocarbon-dated faunules. In addition, we discuss the sampling function of the various depositional processes and comment on the paleoecological implications of these faunules. The herptile material reported here is the first to be described from the Saltville locality, and is also the first to be described from a stratified subaerial, hydraulically deposited site in the middle Appalachians. This is, therefore, a contribution to the controlled chronostratigraphy of late Quaternary herptiles in this region, a contribution free of the collecting and preservation biases characteristic of herpetofaunas from karst or karstlike features in the middle Appalachians.

## STUDY AREA

Saltville Valley lies some 525 m above sea level in the Valley and Ridge Physiographic Province in southwest Virginia (Fig. 1). The floor of this small valley slopes gradually to the north, converging on a water gap that leads to the nearby North Fork of the Holston River. The valley is bordered on the northeast and southeast by foothills of Walker Mountain, and on the northwest by low limestone hills.

The herptiles described in this paper came from four sites on the valley bottom (Fig. 1). Most specimens were collected at SV-1 (the "musk ox" site: 36°52′19″N, 81°46′24″W), located near the southwest end of "The Flat" (McDonald and Bartlett 1983). Six specimens came from SV-2 (the "drug store" site: 36°52′52″N, 81°45′48″W), and one came from CSB-2A (36°52′29″N, 81°45′51″W). The anuran bone collected by VPI-SI in 1966 came from SI-1 (36°52′36″N, 81°46′01″W). SV-1 and CSB-2A are on the Glade Spring quadrangle, and SV-2 and SI-1 are on the Saltville quadrangle, USGS 7.5′ series.

Saltville Valley lies upon the Mississippian Maccrady Formation, a variable sequence of shales, siltstones, limestones, and dolomites containing substantial quantities of gypsum, anhydrite, and halite (Cooper

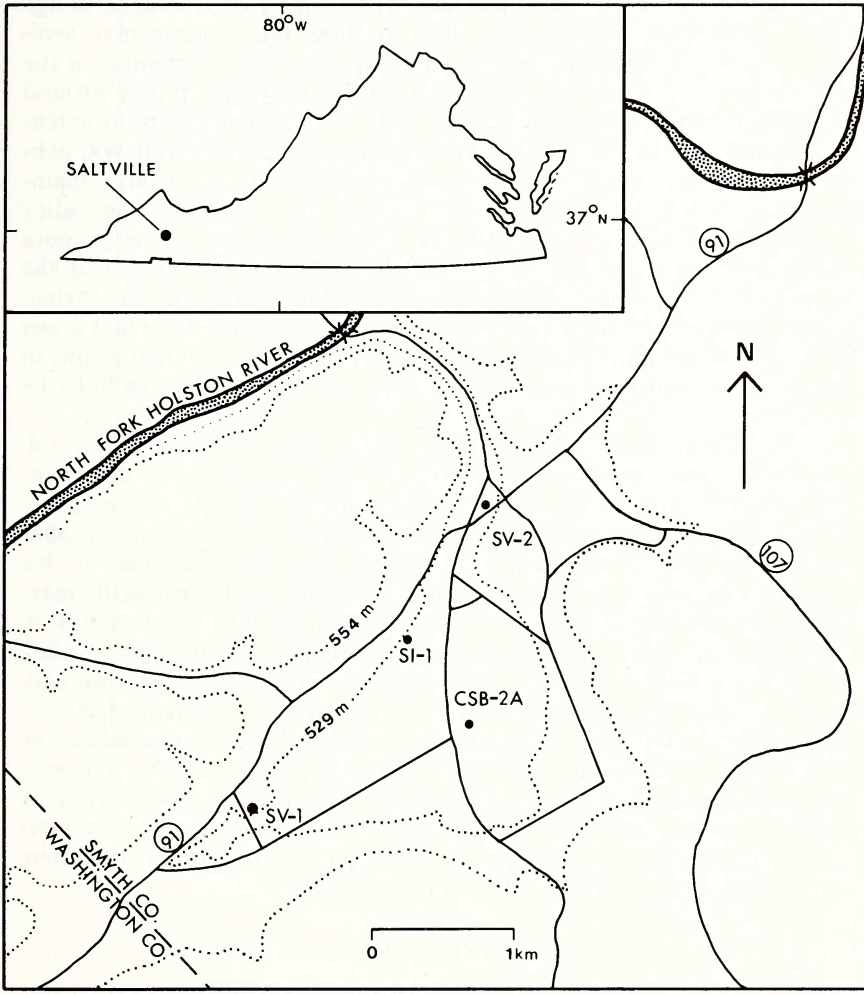


Fig. 1. The Saltville, Virginia, locality, showing location of sites within Saltville Valley that have produced herptile specimens mentioned in text.

1966). This bedrock has been scoured and incised in places by Quaternary stream action, and is now overlain by up to 3 m of late Quaternary sediments.

The Quaternary sediments result from multiple depositional episodes dating from the ?Sangamonian interglaciation through the Holocene (Fig. 2, Table 1). Terrace-like deposits above 530 m in elevation occur at several places around the edge of the valley; these are considered tentatively to date from Sangamon time. Most of the sediments lying below 530 m elevation are late Wisconsinan or Holocene in age (McDonald 1984, 1985a). The older of these late Wisconsinan sediments are fluvial deposits, laid down alongside or in the channel of the extinct Saltville River before its capture by upstream piracy around 14,000 B.P. (McDonald and Bartlett 1983). The oldest and most extensive of these fluvial deposits is a sheet of rounded gravel (Unit W4: pebbles to cobbles), containing numerous bones and teeth of large mammals and a few lag boulders, that occurs over much of the valley bottom. This unit is considered to have been deposited by one or more floods between ca. 27,000 and 14,500 B.P. Within the channel of the Saltville River are finer grained, in places well and differentially sorted, fluvial sediments (Unit W3). These sediments apparently were laid down over a relatively short period as bed load from moderate fluctuations in stream stage/transport capacity, just prior to the piracy of the Saltville River.

A shallow lake—Lake Totten (McDonald 1985b)—formed following the loss of the Saltville River, and persisted as the dominant hydrologic feature of the valley throughout most or all of the subsequent 14,000 years. Some small streams, mostly spring fed, also probably entered the valley during this period. As a consequence of this changed hydrology, fine lacustrine and marsh sediments, primarily massive clays (Units W2, H2), occur over all of the valley below 530 m in elevation and extend over an undetermined part of the upper valley lying above 530 m. The only significant interruption of this clay sequence is a mud-soil-peat mosaic that formed or was deposited over part of the valley around 10,500 to 10,000 B.P., at a time when the water table was lowered in the middle (and upper?) valley. No evidence of an equally lowered water table has been found in the lower valley. A shallow lake and marsh of some 200 acres (about 80 square hectometers) existed in the valley when the first land patents to European settlers were issued late in the 18th Century (Ogle 1981).

## STRATIGRAPHY OF THE SITES

SV-1 lies directly over the southeast side of the Saltville River channel and, as a result, it contains all of the primary Wisconsinan-Holocene stratigraphic units recognized to date (Fig. 2). Since excavations began at this site in October 1980, more than 3,000 vertebrate specimens have been removed from some 200 m of excavated area. Vertebrate remains have been found in all stratigraphic units. Most fossils, however, have been found near the bottom of the lower lake clay (Unit W2: ca. 13,500 B.P.), in the sand and fine gravel deposits of the channel bottom (Unit W3: ca. 14,500 to 13,500 B.P.), and in the coarser gravel sheet (Unit W4: ca. 27,000 to 14,500 B.P.).

Most (18 of 26) of the herptile specimens described in this paper came from SV-1. Twelve specimens were recovered from the channel bottom deposits (Unit W3), which have also yielded large numbers of

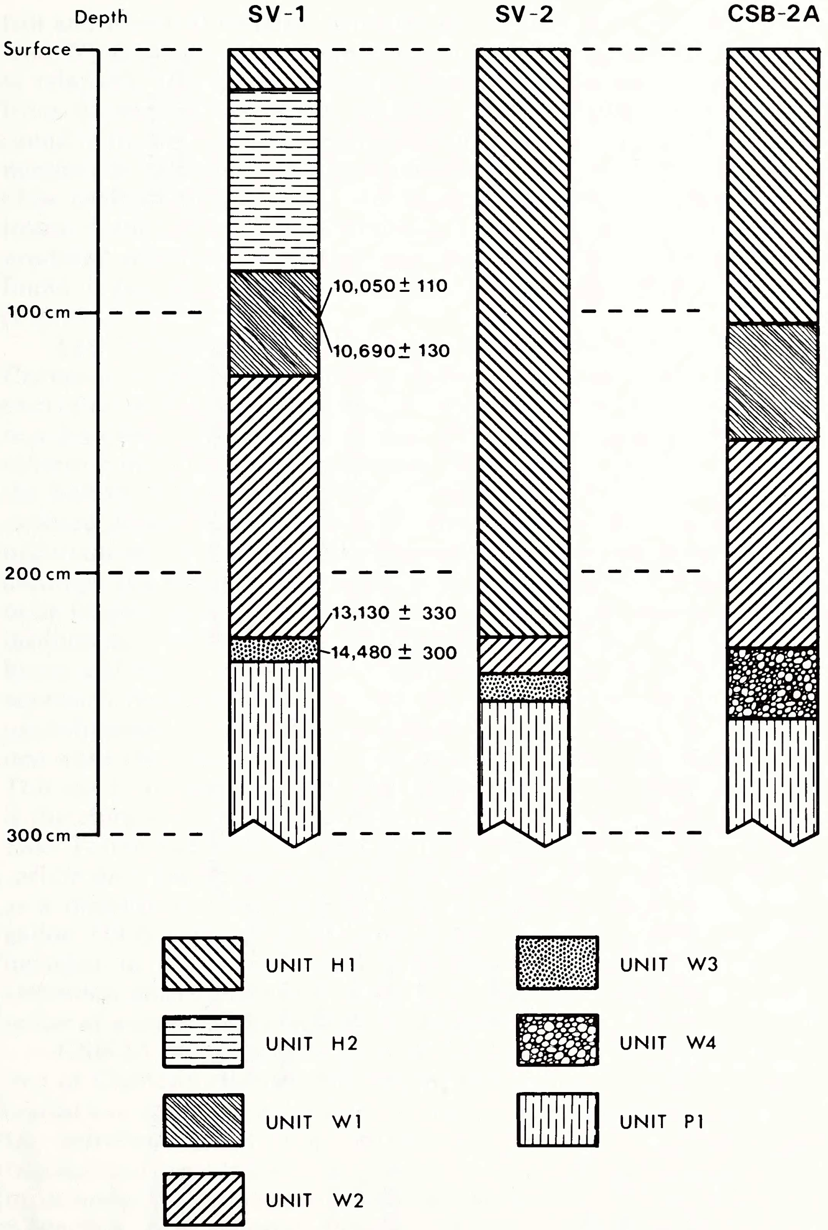


Fig. 2. Stratigraphic profiles for the three sites that have produced generically or specifically identified herptile specimens. Radiocarbon dates on Unit W1 are from samples collected near, but not at, SV-1; those on units W2 and W3 are from samples collected at SV-1.

Table 1. Distribution of herptile specimens in late Quaternary depositional units at Saltville, Virginia.

| Stratigraphic Units[a] | SV-1[b] | SV-2[b] | CSB-2A[b] |
|---|---|---|---|
| H1: Historic Surface | ---- | ---- | ---- |
| H2: Early-?Late Holocene | ---- | ---- | ---- |
| Massive lacustrine/marsh clay | | | |
| W1: Ca. 10,500-10,000 B.P. ?Mass-wasted mud | *Bufo woodhousei fowleri* (USNM 404730)<br>*Chelydra serpentina* (USNM 404741) | ---- | ---- |
| W2: Ca. 13,500-10,500 B.P. | | | |
| Massive lacustrine/marsh clay | | | |
| Upper | ---- | ---- | ---- |
| Lower | *Cryptobranchus alleganiensis* (USNM 404722)<br>*B. w. fowleri* (USNM 404731,-35)<br>*Chelydra serpentina* (USNM 404740) | ---- | ?*Chrysemys picta* (USNM 404721)[c] |
| W3: Ca. 14,500-13,500 B.P. Channel bottom bed load and fine flood gravels. | *Notophthalmus* cf. *N. viridescens* (USNM 404723,-24,-26,-27,-29)<br>*B. w. fowleri* (USNM 404733,-34)<br>*Rana pipiens* group (USNM 404737,-38,-39)<br>*Storeria* sp. (USNM 404744)<br>*Thamnophis* sp. (USNM 404745) | *Notophthalmus* cf. *N. viridescens* (USNM 404725,-28)<br>*B. w. fowleri* (USNM 404732)<br>*Rana pipiens* group (USNM 404736)<br>*Elaphe* cf. *E. obsoleta* (USNM 404742)<br>*Nerodia sipedon* (USNM 404743) | ---- |
| W4: Ca. 27,000-14,500 B.P. Flood gravel (pebble-cobble) | ---- | ---- | ?*Chrysemys picta* (USNM 404721)[c] |
| P1: Mississippian bedrock (Maccrady Shale) | ---- | ---- | ---- |

[a]After McDonald (1984, 1985a).

[b]Cf. Fig. 1 and 2 for location of sites and vertical dimensions.

[c]The exact stratigraphic provenience of USNM 404721 is equivocal. See text for additional comments.

fish and mammal remains. Most of the fish and herptile remains from Unit W3 are in good condition, suggesting that they have been subjected to relatively little fluvial abrasion, whereas the mammal remains range from unabraded to heavily abraded. Four herptile specimens were found in the lower several centimeters of Unit W2, associated with large numbers of mollusk, fish, and mammal remains. These remains do not show evidence of abrasion. Two herptile specimens were found in the lowest 5 cm of Unit W1, a humus-rich mud that has preserved fluid-produced whorls at its contact with Unit W2. Herptiles have not been found to date at SV-1 in units P1, W4, the upper part of W2, H2, or H1 (Fig. 2).

Late in August 1983, the foundation of the old Olin Mathieson Chemical Corporation's company store was demolished and the area excavated with heavy machinery in preparation for construction of a new drug store. This excavation (site SV-2) exposed only artificial fill or otherwise disturbed sediments around most of the periphery and across the bottom, but a small section of undisturbed natural sediment was exposed along the southeast wall. Here, 225 cm of artificial fill was underlain by 13 cm of what appeared to be natural lacustrine clay, although this stratum did contain a few very small ($\leq$ 3 mm) intrusive brick fragments. Beneath the clay was a layer of alluvium, consisting of medium sand to very fine gravel, numerous small pieces of wood, and bones and teeth. No intrusive material was found. This alluvium was separated from the overlying clay by a distinct boundary, and it lay unconformably upon well-scoured bedrock, indicating that it was deposited while the valley was still being drained by vigorously flowing water. This site is low and near the water gap leading to the Holston River; it is therefore unlikely that the alluvium could have been deposited after Lake Totten had formed unless the lake drained periodically. No radiocarbon date was obtained for this deposit, but we tentatively identify it as a member of Unit W3. Six herptile specimens were found in a 5-gallon (19-l) sample of this unit collected 3 September 1983. Also included in this sample was an abraded fragment of a mastodon (*Mammut americanum*) tooth and the unabraded crown of a superior molar of a cervid (*Sangamona* or *Odocoileus*).

CSB-2A was excavated 28 and 30 October 1978, under the direction of Charles S. Bartlett, Jr., as part of an effort to salvage paleontological and archeological resources prior to construction of bleachers at the Saltville softball park. Bartlett reported finding many rounded fragments of large mammal bones and teeth, along with one fragment of turtle bone, in a "pebble zone" that we tentatively assign to Unit W4 (C. S. Bartlett, Jr., field notes, 28 and 30 October 1978; pers. comm.). The turtle bone (USNM 404721) does not, however, show signs of abrasion. Rather, its condition is similar to other remains found in units W2 and W3. Based on the condition of USNM 404721, we suspect that it might have come from the bottom, or from near the bottom, of Unit W2 instead of from within Unit W4, which typically contains noticeably abraded remains of large mammals only. Alternatively, Bartlett's "pebble zone" might have included, or consisted entirely of, Unit W3.

## SYSTEMATIC PALEONTOLOGY

The classification used here follows Dowling and Duellman (1978). The common names used follow Collins et al. (1978). Ranges and notes on modern species follow Conant (1975) or personal observations by J. A. Holman. Numbers are those of the Department of Paleobiology, Division of Vertebrate Paleontology, U.S. National Museum, Washington, D.C. (USNM). All measurements are in millimeters.

### Class Amphibia

### Order Caudata

### Family Cryptobranchidae

Cryptobranchus alleganiensis (Daudin), Hellbender

*Material.* — Trunk vertebra: USNM 404722 (Fig. 3), from Unit W2.

*Remarks.* — This vertebra is indistinguishable from those of modern *Cryptobranchus alleganiensis.* The Saltville fossil may be separated from the extinct species *C. guildayi* Holman of the late Kansan of Trout Cave, West Virginia, on the basis of vertebral ratios. The ratio of the greatest length through the zygapophyses divided into the greatest width through the posterior zygapophyses is .65 in the Saltville *C. alleganiensis* and .56-.65, mean .602, in 18 specimens of modern *C. alleganiensis.* This ratio was .69 in the single available vertebra of *C. guildayi.*

The Hellbender occurs in the area today, and is found usually in rivers and large streams where shelter is available in the form of large rocks, snags, or debris.

### Family Salamandridae

*Notophthalmus* cf. *N. viridescens* (Rafinesque), Eastern Newt

*Material.* — Five trunk vertebrae: USNM 404723, from Unit W3, SV-1; USNM 404724, from Unit W3, SV-1; USNM 404725, from Unit W3, SV-2; USNM 404726, from Unit W3, SV-1; and USNM 404727 (Fig. 4), from Unit W3, SV-1. One femur: USNM 404728, from Unit W3, SV-2. One humerus: USNM 404729, from Unit W3, SV-1.

*Remarks.* — The vertebrae of the genus *Notophthalmus* have a quite characteristic high, posteriorly thickened, posteriorly divided neural spine. These vertebrae appear to be identical to those of the Eastern Newt, *Notophthalmus viridescens.* The femur and the humerus also show no differences from the modern species. The Eastern Newt occurs in the area today, and the habitat of the aquatic stage is ponds, lakes, marshes, ditches, and other quiet bodies of unpolluted water. The terrestrial stage usually hides under objects in forested areas, but at times individuals may be seen walking about in the open. We are unable to tell on the basis of osteological material whether the fossils represent the aquatic or the terrestrial stage.

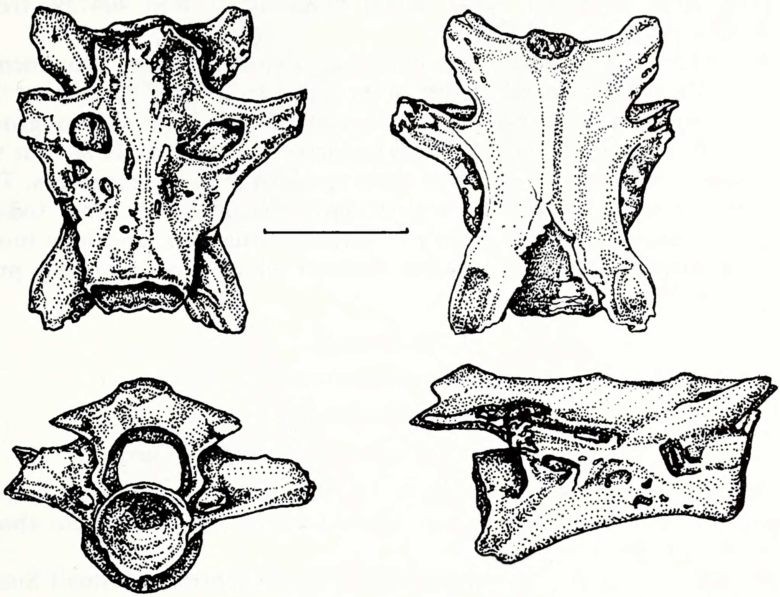

Fig. 3. Trunk vertebra of *Cryptobranchus alleganiensis* (Daudin) (USNM 404722) from Unit W2. Upper left, ventral; upper right, dorsal; lower left, posterior; lower right, lateral. Line equals 5 mm and applies to all drawings.

## Order Anura

### Family Bufonidae

#### *Bufo woodhousei fowleri* Hinckley, Fowler's Toad

*Material.* — Left ilium: USNM 404730, from near (ca. 4 cm above) base of Unit W1, SV-1. Two right ilia: USNM 404731, from Unit W2, SV-1; USNM 404732, from Unit W3, SV-2. Two tibiofibulae: USNM 404733, from Unit W3, SV-1; USNM 404734, from Unit W3, SV-1. Parasphenoid: USNM 404735, from Unit W2, SV-1.

*Remarks.* — Holman (1967) and Wilson (1975) discussed characters of the ilial prominence that allow separation of *Bufo woodhousei fowleri* from the morphologically similar *Bufo americanus. Bufo w. fowleri* is easily separated from its western counterpart *B. w. woodhousei* on the basis of the much higher dorsal protuberance in the latter subspecies. *Bufo w. fowleri* occurs in the area today, and occurs chiefly in sandy areas around shores of lakes, or in river valleys.

### Family Ranidae

#### *Rana pipiens* group, sp. indet.

*Material.* — Right ilium: USNM 404736 (Fig. 5), from Unit W3, SV-2. Two left humeri: USNM 404737, from Unit W3, SV-1; USNM

404738, from Unit W3, SV-1. Right humerus: USNM 404739, from Unit W3, SV-1.

*Remarks.* — The small right ilium has a smooth vastus prominence and has the posterodorsal border of its ilial crest sloping gently into the dorsal acetabular expansion as in species of the *Rana pipiens* group such as *R. pipiens, R. blairi, R. berlandieri,* and *R. utricularia.* But we are unable to determine which of these species the ilium represents. The Southern Leopard Frog, *Rana utricularia,* occurs in the area today. This frog inhabits a wide variety of aquatic situations, and may move quite a distance from the water in summer where growing plants provide shade and shelter.

## Class Reptilia

### Order Testudines

#### Family Chelydridae

*Chelydra serpentina* (Linnaeus), Snapping Turtle

*Material.* — Partial nuchal bone: USNM 404740, from lowest part of Unit W2, SV-1. Scapulocoracoid: USNM 404741, from ca. 5 cm above base of Unit W1, SV-1.

*Remarks.* — These very characteristic bones represent a small Snapping Turtle. Preston (1979) gave some characteristics of chelydrid shell bones that allow identification of fragments. This species occurs in the area today. Snapping Turtles inhabit almost any body of water that is relatively slow moving and permanent (pers. observ.).

#### Family Testudinidae

*Chrysemys picta* Schneider, Painted Turtle

*Material.* — Third right costal: USNM 404721 (Fig. 6), from Unit W2 (?) or W4 (?), CSB-2A.

*Remarks.* — The smooth nature of the dorsal surface of this shell bone, and the position of the impression of the seam for the second epidermal shield, is diagnostic in *Chrysemys picta.* This turtle occurs in the area today and is an inhabitant of quiet, vegetation-choked bodies of water (pers. observ.).

### Order Squamata

#### Family Colubridae

*Elaphe* cf. *E. obsoleta,* Rat Snake

*Material.* — Trunk vertebra: USNM 404742, from Unit W3, SV-2.

*Remarks.* — Auffenberg (1963) gave vertebral characters of *Elaphe obsoleta.* The above trunk vertebra is from a moderately large specimen. This snake occurs in the area today, and is a semiarboreal form that favors wooded areas and woodland edges (pers. observ.).

*Nerodia sipedon* (Linnaeus), Northern Water Snake

*Material.* — Trunk vertebra: USNM 404743, from Unit W3, SV-2.

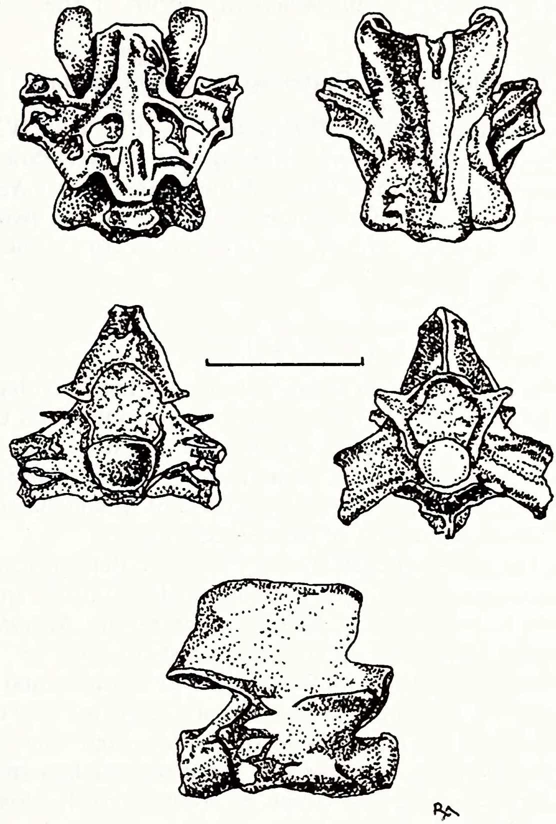

Fig. 4. Trunk vertebra of *Notophthalmus* cf. *N. viridescens* (Rafinesque) (USNM 404727) from Unit W3. Upper left, ventral; upper right, dorsal; middle left, posterior; middle right, anterior; bottom, lateral. Line equals 2 mm and applies to all drawings.

*Remarks.* — Holman (1967) gave vertebral characters that distinguish this species from others in the genus. The Northern Water Snake occurs in the area today and is found in many aquatic situations. Large populations are often to be found where protective shelters occur near aquatic situations (pers. observ.).

*Storeria* sp., Brown Snake or Red-bellied Snake

*Material.* — Trunk vertebra: USNM 404744,a from Unit W3, SV-1.

*Remarks.* — Holman and Winkler (in press) discuss the separation of isolated vertebrae of the closely related genera *Storeria* and *Virginia*. We are unable to separate the vertebrae of the two species of *Storeria*;

both *S. dekayi* and *S. occipitomaculata* occur in the Saltville area today.

*Thamnophis* sp., Gartersnake or Ribbonsnake

*Material.* — Trunk vertebra: USNM 404745, from Unit W3, SV-1.

*Remarks.* — Brattstrom (1967) showed that the vertebrae of *Thamnophis* are more elongate than those of the related genus *Nerodia.* It is almost impossible to separate isolated vertebrae of the two species of *Thamnophis* (*T. sauritus* and *T. sirtalis*) that occur in the vicinity of Saltville today.

## DISCUSSION

The known herptile fauna from Saltville has been divided into three faunules on the basis of the depositional units from which the remains were recovered (Table 1). The taxonomic composition and chronology of these faunules can provide information about the duration of residency of the taxa, the depositional environment in which each was best sampled, and the microhabitat of the respective taxa.

Unit W3, the sorted stream channel bed load deposit found at SV-1 and SV-2, contained seven taxa including all identified specimens of *Notophthalmus* cf. *viridescens, Rana pipiens* group, *Nerodia sipedon, Thamnophis* sp., *Elaphe* cf. *E. obsoleta,* and *Storeria* sp. Only *Bufo woodhousei fowleri* is found in W3 and other depositional units. The stratigraphic nature of Unit W3—silts, sands, and fine gravels, ranging from well sorted and laminated deposits to "unsorted" masses (perhaps mixed biogenically, as by trampling by large mammals)—indicates that the member deposits were laid down by moderately to slowly moving water, perhaps through several cycles of rise and fall. Fluctuations in stream stage would have permitted periodic integration of the remains of terrestrial vertebrates into the stream bed load, especially those taxa that inhabited or periodically used the riparian zone. This might explain the presence of terrestrial taxa, including most of the snakes, in the fluvial deposits. The large amount of woody plant remains of uniform size ($\leq$ 50 mm) in Unit W3 at SV-2 strongly suggests fluvial sorting of "sediments" of terrestrial origin. Alternatively, semi-aquatic or avian predators or scavengers could have dropped the remains of terrestrial prey in or near the stream during feeding. The possibility that large mammals might have mixed units W2 and W3 at SV-1 while watering or feeding has been considered. However, in view of the fact that the composition of the herptile samples in Unit W3 at SV-1 and SV-2 is remarkably similar and that the composition of W2 and W3 at SV-1 are generally different, mixing of these two deposits must be considered unsubstantiated at present. The herptiles of Unit W3 may, therefore, be taken to represent a sampling of the Saltville Valley lotic and riparian herpetofauna as of ca. 14,500 to 14,000 B.P.

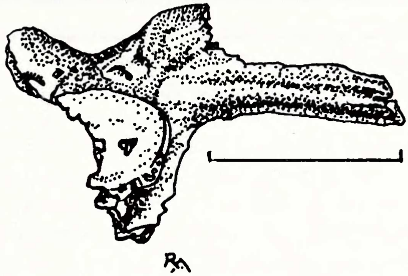

Fig. 5. Right ilium in lateral view of *Rana pipiens* group frog (USNM 404736) from Unit W3. Line equals 5 mm.

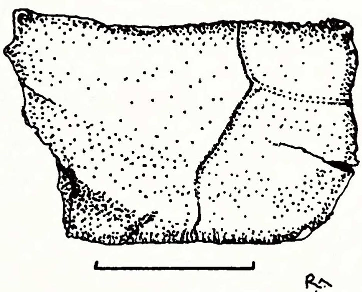

Fig. 6. Third right costal in dorsal view of *Chrysemys picta* Schneider (USNM 404721) from Unit W2 (?) or W4 (?). Line equals 10 mm.

Deposits associated with the early history of Lake Totten (ca. 14,000 to 12,000 B.P.) include ostracods, pelecypods, gastropods, fish, and mammal remains as well as those of *Cryptobranchus alleganiensis, Bufo woodhousei fowleri, Chelydra serpentina,* and (?) *Chrysemys picta.* Most of the aquatic fauna of Lake Totten probably was residual from that of the Saltville River, although the change in local hydrology caused a shift in the dominant taxa and altered the collecting bias of the depositional environment. The kinds of turtles represented are compatible with the postulated lake environment, and the remains of Fowler's Toad could easily have been deposited following death in or alongside the lake. The environmental implication of the Hellbender is more equivocal; it could have occupied a spring-fed brook entering Lake Totten near SV-1 (as does a small stream today), or it could represent feeding residue dropped by a predator or scavenger. The middle and upper parts of Unit W2 yield very few faunal remains. The reasons for this are unclear, but could include any or all of the following: change in water quality, water level fluctuation, and infilling of Lake Totten near SV-1.

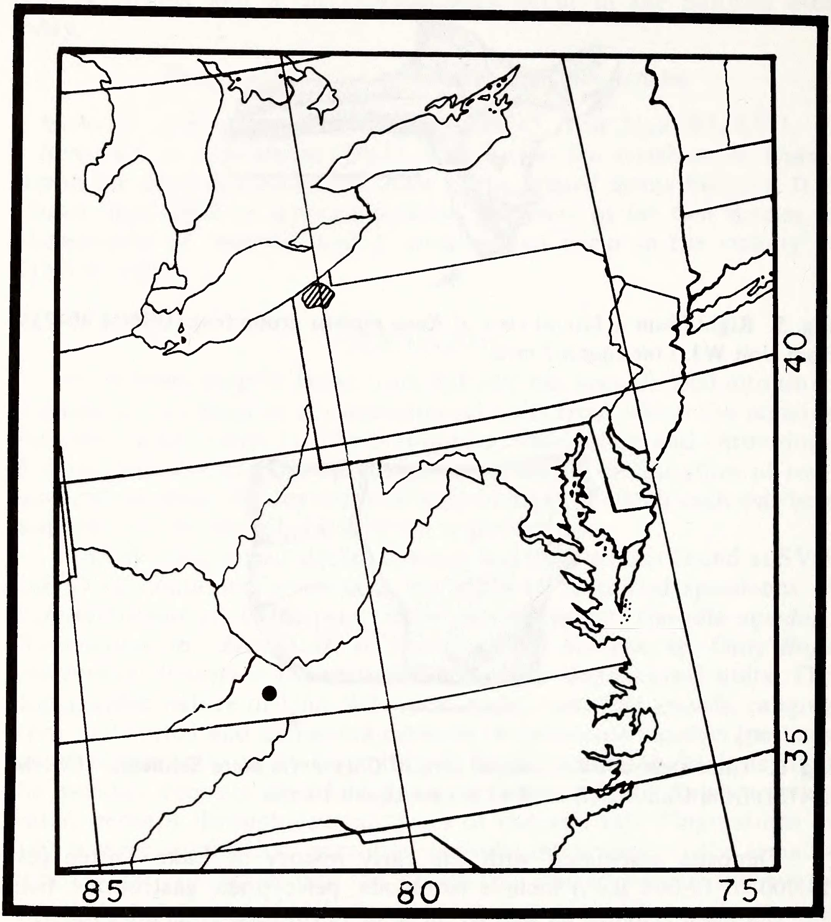


Fig. 7. Map showing the most northern area (crosshatched) where all members of the Saltville herpetofauna (dot) may be found living together today.

Unit W1, lying astride the Wisconsin-Holocene boundary (ca. 10,500 to 10,000 B.P.), consists of an organic-rich mud at SV-1 that contains remains of *Bufo woodhousei fowleri* and *Chelydra serpentina.* The boundary between W2 and W1 was distinct below where USNM 404730 and USNM 404741 were found, which suggests that these isolated remains were transported with the mud when—or deposited after—it moved, rather than being moved upward from the underlying lake deposit by bioturbation. Conceivably, the mud encompassing these specimens was a littoral deposit displaced by the downslope movement of a larger wasting mass from the adjacent hills. Because only two isolated bones were found, it is unlikely that the mud slide killed and buried the individuals from which these specimens came. Using this reasoning, both Fowler's Toad and the Snapping Turtle appear to have been present throughout the first 4,000 years of Lake Totten's history.

All of the herptile taxa present in the Saltville faunules can be found living in this area today. Based upon the presence of all 10 species in the herpetofauna in units W2 (lower) and W3, it is reasonable to conclude that this fauna has been in place for at least the last 13,500 to 15,000 years. Differences in the taxonomic composition of the faunules are probably attributable to microhabitat changes associated with hydrologic changes in the valley and to different sampling biases of the various depositional processes represented.

The most northern area where all members of the Saltville herpetofauna may be found living together today is in extreme northeastern Pennsylvania (Fig. 7) (Conant 1975: maps 3, 22, 99, 116, 119, 127, 149, 188, 198, 265, and 303). The Saltville herpetofauna, therefore, clearly is not a "Boreal" herpetofauna. Boreal temperatures as we know them today would not provide enough warm days for the eggs of *Chelydra serpentina, Chrysemys picta,* and *Elaphe* cf. *E. obsoleta* to hatch. The summers of ca. 15,000 to 14,000 B.P., and those since, must have been warm enough for the eggs of these species to hatch (cf. Stuart 1979).

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